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10/559,615	12/02/2005	Youichi Nanba	Q76011	1679

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EXAMINER	
CHUO, TONY SHENG HSIANG	
ART UNIT	PAPER NUMBER
1729	

NOTIFICATION DATE	DELIVERY MODE
12/08/2010	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

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Office Action Summary	Application No.	Applicant(s)	
	10/559,615	NANBA ET AL.	
	Examiner	Art Unit	
	Tony Chuo	1729	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *13 September 2010*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-5,7-13,15-23 and 26-30* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-5,7-13,15-23 and 26-30* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *11/12/10*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Response to Amendment

1. Claims 1-5, 7-13, 15-23, and 26-30 are currently pending. Claims 6, 14, 24, 25, 31, and 32 are cancelled. The amendment does not overcome the previously stated 102 and 103 rejections. Therefore, upon further consideration, claims 1-5, 7-13, 15-23, and 26-30 stand rejected under the following 102 and 103 rejections.

Information Disclosure Statement

2. The information disclosure statement (IDS) submitted on 11/12/10 was filed after the mailing date of the Non-Final Rejection on 6/11/10. The submission is in compliance with the provisions of 37 CFR 1.97. Accordingly, the information disclosure statement is being considered by the examiner.

Claim Rejections - 35 USC § 102/103

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and

> the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

5. Claims 1-5, 7-9, 11-13, 15-23, and 26-30 are rejected under 35 U.S.C. 102(b) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over Sudo et al (WO 03/028128).

Regarding claims 1, 2, and 26-29, the Sudo reference discloses a lithium secondary battery comprising an electrode made of a molded product of an electrode paste comprising a carbon powder and binder, wherein the carbon powder is produced by causing raw materials of a polymer to permeate into carbonaceous particles and subsequently curing (polymerizing) the raw materials, followed by thermal treatment at a temperature of 2900°C; wherein the curing is carried out under heating at a temperature of 150°C; wherein the carbonaceous particles have an average particle size of 10 to 25 μm (page 31, lines 16-18, page 32, lines 13-15, page 33, lines 27-28 and Example 1).

Examiner's note: The examiner takes the position that "a graphite crystal structure region and an amorphous structure region are distributed throughout the entirety of a particle constituting the carbon material from the surface of the particle to a center portion thereof" is an inherent characteristic of the Sudo carbon powder because Sudo teaches the same carbonaceous particles and polymer that are formed by a deposition process that inherently impregnates the carbonaceous particle from the surface to the center portion. The examiner contends that the process of stirring a solution of natural graphite particles and varnish A (raw materials of a polymer) for 30 minutes in a planetary mixer is sufficient to impregnate the graphite particles from the

surface to the center portion with the polymer (See Example 1). Burden is on the applicant to show differences in product comparison.

Regarding claims 3 and 4, it also discloses polymer that is selected from the group consisting of phenol resin, polyvinyl alcohol resin, furan resin, cellulose resin, polystyrene resin, polyimide resin, and epoxy resin; wherein phenol resin is more preferred (page 18, lines 17-21).

Regarding claim 5, it also discloses drying oil or fatty acid derived therefrom that is added during the course of reaction of the phenol resin raw material (page 18, lines 22-29).

Regarding claim 7, an area ratio of a graphite crystal structure region having diffraction pattern formed of two or more spots to an amorphous structure region having a diffraction pattern formed of only one spot attributed to (002) plane is 99 to 20 : 1 to 70 is an inherent property of a graphite particle that has been impregnated with a phenol resin polymer and heat treated at 2900°C.

Regarding claim 8, it also discloses performing multiple times a process of causing the polymer raw materials to deposit and permeate into the graphite particles and subsequently polymerizing the organic compound, followed by thermal treatment (page 26, lines 18-26).

Regarding claim 9, it also discloses an amount of phenol resin that is 4 to 25 mass% (page 21, lines 16-18).

Regarding claim 11, it also discloses a boron carbide that is incorporated into the carbonaceous powder in an amount of 0.1 to 5 mass% which corresponds to an amount of 10 to 5,000 ppm (See page 31, lines 4-7).

Regarding claim 12, it also discloses adding boron in subsequent heat treatment which is after polymerization of the polymer (page 27, lines 6-8).

Regarding claim 13, it also discloses carbonaceous particles that includes petroleum based coke, coal-based coke, and natural graphite (page 15 line 31 to page 16 line 2).

Regarding claims 15-22, it also discloses carbon fiber that is deposited onto the surface of the carbon powder, wherein the carbon fiber has a filament diameter of 2 to 1,000 nm, wherein the amount of carbon fiber is preferably 2 to 10 mass%, wherein the carbon fiber is vapor grown carbon fiber having an aspect ratio of 10 to 15,000, wherein the vapor grown carbon fiber is graphitized carbon fiber which has undergone thermal treatment at 2,000 to 3,000°C, wherein the fiber filament of the vapor grown carbon fiber includes a hollow space extending along its center axis, wherein the vapor grown carbon fiber contains branched carbon fiber filaments, wherein the vapor grown carbon fiber has at (002) plane, an average interlayer distance (d_{002}) of 0.3395 nm or less as measured by x-ray diffraction (page 21 line 20 to page 24 line 23).

Regarding claim 23, it also discloses a carbon material that has a specific surface area of 3 m^2/g or less as measured through a BET method (page 32, lines 16-19).

Regarding claim 30, it also discloses a non-aqueous electrolytic solution, wherein the non-aqueous solvent employed for the non-aqueous electrolytic solution contains at least one selected from the group consisting of ethylene carbonate, diethyl carbonate, dimethyl carbonate, methyl ethyl carbonate, propylene carbonate, butylene carbonate, and vinylene carbonate (page 37, lines 7-10).

Claim Rejections - 35 USC § 103

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

7. Claims 1-5, 7, 9, 10, 13, 15, 18, 19, 22, 23, and 26-30 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yamada (JP 10-116605) in view of Nakai et al (US 6447946).

Regarding claims 1, 2, 5, 15, 18, 19, and 26-30, the Yamada reference discloses a lithium secondary battery comprising a negative electrode made of a molded product of an electrode paste comprising a carbon material and a polyvinylidene fluoride (binder), wherein the carbon material comprises a thermosetting resin (polymer) that is impregnated into carbon fiber particles that are further carbonized and graphitized at a temperature of 2000-3000°C; wherein the negative electrode comprises a 2-phase structure of graphitized carbon fiber (paragraphs [0014],[0016],[0023],[0025]).

Examiner's note: The examiner takes the position that the process of impregnating the carbon fiber particles with the thermosetting resin results in the resin not only coating the surface of the carbon fiber particles, but also permeating into the carbon fiber particles such that a graphite crystal structure region and an amorphous structure region are distributed throughout the entirety of a particle constituting the carbon material from the surface of the particle to a center portion thereof. Further, it is noted that claims 1 and 2 are being construed as product-by-process and that the product itself does not depend on the process of making it. Accordingly, in a product-by-process claim, the patentability of a product does not depend on its method of production. (In re Brown 173 USPQ 685 and In re Fessman 180 USPQ 324, See MPEP 2113: Product-by-Process claims). In addition, it is well known in the art that lithium secondary battery comprises a non-aqueous electrolyte solution that contains ethylene carbonate, diethyl carbonate, and dimethyl carbonate.

However, Yamada does not expressly teach carbonaceous particles that have an average particle size of 10 to 40 μm (claim 1); carbon fiber having a filament diameter of 2 to 1,000 nm (claim 15), wherein the carbon fiber is vapor grown fiber that each has an aspect ratio of 10 to 15,000 (claim 18). The Nakai reference discloses a negative electrode of a lithium ion secondary battery comprising vapor grown carbon fiber that has a filament diameter of 200 nm and a fiber length (particle size) of 15 μm (15,000 nm), which corresponds to an aspect ratio of 75 (col. 4, lines 1-9 and Example 6).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the Yamada negative electrode material to

include carbonaceous particles that have an average particle size of 10 to 40 μm; carbon fiber having a filament diameter of 2 to 1,000 nm, wherein the carbon fiber is vapor grown fiber that each has an aspect ratio of 10 to 15,000 in order to utilize carbon fiber particles that improve the cycle characteristics of the battery while having high capacity and high power. In addition, there is no evidence of the criticality of the claimed range of the average particle size of the carbonaceous particles.

Regarding claims 3 and 4, it also discloses a thermosetting resin such as phenol resin, furan resin, and polyimide resin (paragraph [0018]).

Regarding claim 7, an area ratio of a graphite crystal structure region having diffraction pattern formed of two or more spots to an amorphous structure region having a diffraction pattern formed of only one spot attributed to (002) plane is 99 to 20 : 1 to 70 is an inherent property of a carbon fiber particle that has been carbonized and graphitized at 2000°-3000°C.

Regarding claims 9 and 10, it also discloses a weight ratio of resin (organic compound) to carbon fiber of 50 parts to 200 parts resin to 100 parts carbon fiber (paragraph [0018]).

Regarding claim 13, it also discloses particles formed of pitch based carbon fiber (paragraph [0017]).

Regarding claim 22, it also discloses carbon fiber that has an average interlayer distance (d_{002}) of less than 0.340 nm (paragraph [0019]).

Regarding claim 23, it also discloses T-300 carbon fibers that inherently have a specific surface area of 0.45 m^2/g as evidenced by the Material Property Data Sheet for

T-300 carbon fiber (Table 1).

8. Claim 8 is rejected under 35 U.S.C. 103(a) as being unpatentable over Yamada (JP 10-116605) in view of Nakai et al (US 6447946) as applied to claim 1 above.

However, Yamada as modified by Nakai et al does not expressly teach a carbon material that is produced by performing multiple times a process of causing the organic compound to deposit onto and/or permeate into the carbonaceous particles and subsequently polymerizing the organic compound, followed by thermal treatment at a temperature of 1,800 to 3,300°C. Examiner's note: It is noted that claim 8 is being construed as product-by-process and that the product itself does not depend on the process of making it. The product is construed as a carbon particle that multiple layers of polymer coated onto the particle.

However, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the Yamada/Nakai negative electrode material to include a carbon material that is produced by performing multiple times a process of causing the organic compound to deposit onto and/or permeate into the carbonaceous particles and subsequently polymerizing the organic compound, followed by thermal treatment at a temperature of 1,800 to 3,300°C because duplicating part for multiple effect was held to have been obvious (*In re Harza*, 274 F.2d 669, 671, 124 USPQ 378, 380 (CCPA 1960)).

9. Claims 11 and 12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yamada (JP 10-116605) in view of Nakai et al (US 6447946) as applied to claim 1 above, and further in view of Yamazaki et al (US 2002/0160266).

However, Yamada as modified by Nakai et al does not expressly teach a carbon material that contains boron in an amount of 10 to 5,000 ppm (claim 11), wherein boron or boron compound is added after polymerization of the organic compound, followed by thermal treatment at 1,800 to 3,300°C (claim 12). The Yamazaki reference discloses a negative electrode material of a lithium ion secondary battery comprising carbon fiber that is mixed with a boron compound and then graphitized which implies that the boron compound is added before thermal treatment, wherein the boron compound is added in an amount of 0.5 to 5% by weight which corresponds to an amount of 10 to 5,000 ppm (paragraph [0058],[0059]).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the Yamada negative electrode material to include a carbon material that contains boron in an amount of 10 to 5,000 ppm, wherein boron or boron compound is added after polymerization of the organic compound, followed by thermal treatment at 1,800 to 3,300°C in order to accelerate the graphitization of the carbon fiber, thereby producing a graphite material for a negative electrode of a lithium ion secondary battery that is large in charge/discharge capacity, high in charge/discharge efficiency, and low in deterioration of battery cycle characteristics (paragraph [0025]). In addition, there is no evidence of the criticality of the claimed range of the amount of boron compound.

10. Claims 16 and 17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yamada (JP 10-116605) in view of Nakai et al (US 6447946) as applied to claim 15 above, and further in view of Mrotek et al (US 5776633).

However, Yamada as modified by Nakai et al does not expressly teach at least a portion of the carbon fiber that is deposited onto the surface of the carbon powder (claim 16), wherein the amount of carbon fiber is 0.01 to 20 parts by mass on the basis of 100 parts mass of the carbonaceous particles (claim 17). The Mrotek reference discloses carbon/carbon composite useful as components of electrode structures of batteries comprising a mixture of carbon powder and carbon fiber, wherein the ratio of carbon fiber to carbon powder is 20% carbon fiber to 80% carbon powder (col. 4, lines 22-42).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the Yamada/Nakai negative electrode material to include carbon powder, wherein at least a portion of the carbon fiber is deposited onto the surface of the carbon powder, wherein the amount of carbon fiber is 0.01 to 20 parts by mass on the basis of 100 parts mass of the carbonaceous particles in order to utilize materials that provide improvements in mechanical properties, resistivity, and surface area.

11. Claim 20 is rejected under 35 U.S.C. 103(a) as being unpatentable over Yamada (JP 10-116605) in view of Nakai et al (US 6447946) as applied to claim 18 above, and further in view of Gernov et al (US 6194099).

However, Yamada as modified by Nakai et al does not expressly teach each fiber filament of the vapor grown carbon fiber that includes a hollow space extending along its center axis. The Gernov reference discloses carbon nanofibers in the form of hollow tubes that are suitable for use in a battery electrode (col. 8, lines 24-25).

Therefore, the invention as a whole would have been obvious to one of ordinary skill in the art at the time the invention was made because the disclosure of Gernov indicates that carbon nanofibers in the form of hollow tubes is a suitable material for use as a battery electrode. The selection of a known material based on its suitability for its intended use has generally been held to be *prima facie* obvious (MPEP §2144.07). As such, it would be obvious to use carbon nanofibers in the form of hollow tubes.

12. Claim 21 is rejected under 35 U.S.C. 103(a) as being unpatentable over Yamada (JP 10-116605) in view of Nakai et al (US 6447946) as applied to claim 18 above, and further in view of Nishimura et al (US 6528211).

However, Yamada as modified by Nakai et al does not expressly teach vapor grown carbon fiber that contains branched carbon fiber filaments. The Nishimura reference discloses a battery electrode material comprising carbon nanofibers having branching fibers made by vapor phase growth methods (col. 4, lines 27-30).

Therefore, the invention as a whole would have been obvious to one of ordinary skill in the art at the time the invention was made because the disclosure of Nishimura indicates that carbon nanofiber having branching fibers made by vapor phase growth methods is a suitable material for use as a battery electrode. The selection of a known material based on its suitability for its intended use has generally been held to be *prima facie* obvious (MPEP §2144.07). As such, it would be obvious to use carbon nanofiber having branching fibers made by vapor phase growth methods.

Response to Arguments

13. Applicant's arguments filed 9/13/10 have been fully considered but they are not persuasive.

The applicants argue that Sudo et al provide a non-uniform structure, whereas the present invention provides a substantially uniform structure. Sudo et al fail to teach particular core particles and teach that resin is deposited onto natural graphite particles. Phenol resin normally is not a graphitizable raw material. Therefore, the carbon derived from phenol resin in Sudo et al is amorphous carbon, even after it is heated at a high temperature. This means that the surface having a large amount of the resin in Sudo et al becomes amorphous-rich carbon. Accordingly, the crystallinity in Sudo et al becomes non-uniform on the surface and at the core of the obtained particles.

In response, the examiner would like to first point out that the argument is not commensurate with the scope of the claims. There is no limitation in the claims that requires a substantially uniform structure from the surface to the center portion of the particle. Secondly, there is no limitation in the claims that preclude the use of natural graphite particles. Thirdly, even assuming that phenol resin is not a graphitizable raw material and the carbon derived from phenol resin in Sudo et al is amorphous carbon, there is no evidence to show that phenol resin does not permeate into natural graphite particles to form graphite crystal structure regions and amorphous structure regions distributed throughout the entirety of the carbon material.

The applicants further argue that the core particles are different in the two inventions. The present invention uses carbon in which resin is ready to permeate. The

core particle in Comparative Example 1 of the present invention is equivalent to that in Example 1 of Sudo, and the core particle in Comparative Example 1 and Sudo et al cannot provide the uniform structure as defined in present claim 1.

In response, the examiner would like to point out that prior art references are not limited to the specific examples disclosed in the reference. The Sudo reference also discloses examples of other carbonaceous particles that include fired organic compounds, fired natural organic compounds, fired mesocarbon microbeads, fired resins, petroleum based coke, coal based coke, and artificial graphite. In addition, there's no evidence to show that the carbonaceous particles disclosed in Sudo et al cannot provide the uniform structure as defined in present claim 1.

The applicants further argue that Yamada and Nakai et at do not disclose or render obvious the presently claimed invention. Applicants first note that with respect to carbonaceous particles that have an average particle size of 10 to 40 μm, the Examiner does not contend that Nakai et al disclose such particles.

In response, the examiner disagrees with the applicants assumption regarding the Nakai reference. As clearly stated in the 103 rejection, Nakai et al is relied upon for teaching a carbon fiber (carbonaceous particle) that has a fiber length (particle size) of 15 μm which is within the range of 10 to 40 μm.

The applicants further argue that Yamada teaches away from the present invention. The two-layer structure in Yamada is a prerequisite for the negative electrode material of Yamada, which teaches away from the present invention comprising a substantially uniform structure as an essential requirement.

In response, the examiner disagrees that Yamada teaches away from the present invention. Yamada discloses a 2-phase structure of graphitized carbon fiber, wherein phenol resin is impregnated into the carbon fiber, heat-treated, and graphitized. Therefore, the examiner takes the position that this 2-phase structure comprises graphite crystal structure regions and amorphous structure regions distributed throughout graphitized carbon fiber particle.

Conclusion

THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Tony Chuo whose telephone number is (571)272-0717. The examiner can normally be reached on M-F, 9:00AM to 5:30PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Ula Ruddock can be reached on (571) 272-1481. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

TC

/Ula C Ruddock/
Supervisory Patent Examiner, Art Unit 1795